## REMARKS

Claims 1-8 are all the claims pending in the application. Applicants have amended claims 1-7 for purposes of clarity and added new claim 8. Support for amended claims 1-7 and new claim 8 can be found, for example, on page 6, line 22-23; page 7, lines 8-9; page 8, line 11 and page 10, lines 5-13 of the present specification.

Entry of the above amendments is respectfully requested.

Initially, Applicants thank the Examiner for acknowledging Applicants' claim to priority under 35 U.S.C. §119, and for confirming receipt of the priority document from the International Bureau.

### I. Response to rejection of claims 1-7 under 35 U.S.C. § 112, second paragraph

On pages 2-3 of the Office Action, the Examiner rejects claims 1-7 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention.

**A.** With respect to the term "hard", Applicants respectfully traverse this rejection for the reason that a person of skill in the art would understand the meaning of "hard". Initially, we note that the Examiner asserts that Magara et al. discloses producing wear resistant (hard) coatings at page 5, line 10 of the Office Action.

"Hard coating" is a term of art in the field of electric discharge surface treatment. For example, at col. 1, lines 27-31, Magara et al. discloses that during EDM, the submetal electrode forms a solid surface layer that is not susceptible to aqua regia

and is difficult to damage, e.g., it is not spallable or easily cracked when subjected to several tons of force.

Therefore, Applicants submit that a person of ordinary skill in the art would understand the term "hard coating", which does not render the claim indefinite or vague.

**B.** With respect to the issues raised by the Examiner regarding claim 1, Applicants submit that the green-compact electrode of the present invention comprises a metal powder and a working fluid having a carbon component, such as a kerosene type oil-based working fluid. *See* page 6, line 22-23 and page 7, lines 8-9 (and page 8, line 11). The "working fluids" used in the present application are well known in the art. Also, the working fluid used in the green-compact electrode has the same composition as the working fluid used during electrical discharge surface treatment. Therefore, Applicants have amended claim 1 accordingly.

**C.** With respect to the ratio in claim 2, Applicants submit that the ratio is wt % of fluid/(material + fluid) and therefore, the green-compact electrode comprises 5-10 wt % fluid and 90-95 wt % metal powder. Therefore, Applicants have amended claim 2 accordingly.

**D.** With respect to the lack of proper antecedent basis for "a green-compact electrode", the Examiner will note that such issue has been overcome in view of the amendments to claim 3.

**E.** With respect to where the hard coating is coming from in the process of claim 4, Applicants respectfully traverse for the reason that a person of ordinary skill

in the art would understand how the hard coating is formed. At page 8, lines 11-15, the present specification discloses that:

> the carbon which is the component in the working fluid and Ti which is the component in the green-compact electrode react with each other, causing a hard TiC to be produced. As a result, the hard coating film is formed on the surface of the object which must be machined.

Therefore, Applicants submit that a person of skill in the art would understand the scope of claim 4. In addition, claim 4 has been amended to make the claim scope more clear without reduction in claim scope.

**F.** With respect to the Examiner's assertion that the essential scope of claims 1, 3 and 6 appear to be the same, Applicants submit that claims 1 and 3 are different in scope since claim 1 is a product claim and claim 3 is a process claim. With respect to claim 6, Applicants have amended claim 6 to recite additional features, such as a work, working tank. *See* page 7, lines 6-8. Therefore, Applicants submit that the scope of claims 1, 3 and 6 are not the same.

**G.** With respect to the issues raised by the Examiner regarding claim 7, Applicants have amended claim 7 for purposes of clarity, without reduction in claim scope.

In view of the above, Applicants submit that a person of skill in the art would understand the meaning and scope of the claims. Therefore, Applicants respectfully request that the rejections be withdrawn.

## II. Response to rejection of claims 1, 3, and 6 under 35 U.S.C. 102(b)

On page 4 of the Office Action, the Examiner rejects claims 1, 3 and 6 under 35 U.S.C. § 102(b) as allegedly being anticipated by Vignaud (U.S. Patent 4,440,835).

Applicants respectfully traverse this rejection for the following reasons.

The present invention relates to a green-compact electrode for discharge surface treatment, a method of producing such electrode and an apparatus containing such electrode. A green-compact electrode is used to form a surface layer on a workpiece using an electric discharge. The green-compact electrode comprises a mixture of metal power and a fluid, such as kerosene.

Vignaud relates to a thin electrode for electrochemical devices or generators (batteries and accumulators, i.e., primary and secondary cells). *See* col. 1, lines 5-7. Specifically, the electrode of Vignaud comprises a conductive material, PTFE, a lubricant and optionally a surfactant. *See* Abstract. Therefore, the electrode of Vignaud is not an electrode that can be used for electric discharge surface treatment.

In addition, Vignaud does not teach that the electrode comprises a metal powder. The only references to metal appears with respect to the metal used as a current collector or a carbon catalyzed by Ag as a catalytic active compound. Specifically, Vignaud discloses that a current collector is formed by a thin (0.05 mm) adherent porous metal film deposited on an electrode. *See* col. 4, lines 17-19.

Further, Vignaud discloses that the lubricant is eliminated from the electrode at col. 5, lines 4-6. Therefore, the electrode of Vignaud does not contain a lubricant.

Accordingly, Vignaud does not teach or suggest the green-compact electrode of the present invention. Therefore, Applicants respectfully request that the rejection be reconsidered and withdrawn.

## III. Response to rejection of claims 2 and 4 under 35 U.S.C. 103(a)

On pages 4-5 of the Office Action, the Examiner rejects claims 2 and 4 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Vignaud.

Applicants respectfully traverse this rejection for the reason that claims 2 and 4 should be allowed at least by virtue of their dependence from claims 1 and 3, respectively, which are not taught or suggested as discussed above.

In addition, with respect to claim 2, since the lubricant is eliminated in Vignaud, Vignaud does not teach or suggest a green-compact electrode containing 5-10 wt % working fluid in its final state, as required in the present invention.

In view of the above, Applicants respectfully request that the rejection be withdrawn.

## IV. Response to rejection of claims 5 and 7 under 35 U.S.C. 103(a)

On page 5 of the Office Action, the Examiner rejects claims 5 and 7 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Vignaud in view of Magara et al. (U.S. Patent 5,698,114).

Applicants respectfully traverse this rejection for the following reasons.

Applicants submit that a person of ordinary skill in the art would not be motivated to combine Vignaud and Magara et al.

Vignaud, as discussed above, is related to an electrode that can be used in, for example, a battery. Accordingly, the electrode of Vignaud contains active material, such as graphite. In contrast, Magara et al. is directed to an apparatus and process for

forming surface layers on electrodes by electron discharge machining. Accordingly, a person of ordinary skill in the art would not be motivated to combine Vignaud and Magara et al. because the references are directed to different technical fields.

In addition, obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching, suggestion or incentive supporting the combination. *See* MPEP 2143.

There is no disclosure in Vignaud that would motivate a person of ordinary skill in the art to use Vignaud's electrode as a source for forming a surface layer. In addition, there is no disclosure in Magara et al. that would motivate a person of ordinary skill in the art to use Vignaud's electrode in the process of Magara et al. Accordingly, a person of ordinary skill would not combine the two references to arrive at the present invention.

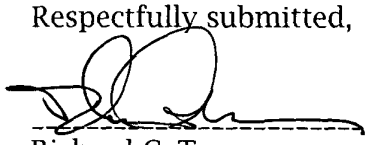
In view of the above, Applicants respectfully request that the rejection be withdrawn.

## V. Conclusion

Reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,



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## APPENDIX

## VERSION WITH MARKINGS TO SHOW CHANGES MADE IN THE SPECIFICATION:

**On page 2, the first full paragraph and the paragraph bridging pages 2 and 3:**

When the green-compact electrode shown in Fig. 5 is molded, great pressure is generated on the side surfaces of the die 52. Therefore, mold release characteristics required after the molding process are unsatisfactory. Thus, there arises a problem in that the green-compact electrode obtained by compression molding is easily broken. Another problem arises in that the green-compact electrode is too brittle. Therefore, [there arises a problem in that] the manufacturing yield of the green-compact electrode excessively deteriorates. When the brittle green-compact electrode is employed in a discharge surface treatment, [there arises a problem in that] the hard coating film formed on the object, which has been subjected to the discharge surface treatment, cannot be [uniformed] uniform.

To overcome the above-mentioned problems, a mold release agent or a hardener is required. When oleic acid or the like is employed which is usually employed as a mold release agent for a sintered body, the mold release agent disperses and [melted] melts in the working fluid. Therefore, components in the working fluid are changed. Therefore, [there arises a problem in that] a coating film having a required quality and hardness cannot be formed on the surface of the object which must be machined. Also, the use of usual hardeners [suffer from] causes similar problems.

**On page 13, first full paragraph:**

The apparatus for performing discharge surface treatment disclosed in the sixth aspect of the present invention comprises: the material of the green-compact electrode

for discharge surface treatment and the fluid which is the same as the working fluid which constitute the green-compact electrode for discharge surface treatment. Therefore, [an effect can be obtained in that the] a discharge surface treatment apparatus can be obtained [with which] where repetition of the discharge surface treatment does not exert an influence on the formation of the hard coating film on the object which must be machined. Hence it follows that [an effect can be obtained in that] uniform hard coating film can be formed and the film forming performance of the material of the electrode can be obtained.

**IN THE CLAIMS:**

1. (amended) A green-compact electrode for electrical discharge surface treatment of a work [which uses a discharging operation in working fluid so as to form a hard coating film on the surface of an object which must be machined, said green-compact electrode for discharge surface treatment being characterized by] comprising: a mixed material of a [material of said green-compact electrode for discharge surface treatment] metal powder and a [fluid which is the same as said] working fluid having a carbon component.

2. (amended) A green-compact electrode for electrical discharge surface treatment according to claim 1, [characterized in that] wherein [a mixture ratio of the fluid which is the same as said] the working fluid [with respect to said] constitutes 5 wt % to 10 wt % of the green compact electrode [for discharge surface treatment is 5 wt % to 10 wt %].

3. (amended) A method of manufacturing a green-compact electrode for electrical discharge surface treatment [characterized by] comprising: the step of[:] compression-molding a mixed material of a [material of a green-compact electrode for discharge surface treatment] metal powder and a [fluid which is the same as] working fluid having a carbon component [to manufacture a green-compact electrode for discharge surface treatment].

4. (amended) A method of manufacturing a green-compact electrode for electrical discharge surface treatment according to claim 3, [characterized in that] wherein a mixture ratio of the [fluid which is the same as said] working fluid [with respect to said] constitutes 5 wt % to 10 wt % of the green compact electrode [for discharge surface treatment is 5 wt % to 10 wt %].

5. (amended) A method of performing electrical discharge surface treatment [such that a green-compact electrode for discharge surface treatment is used and a discharging process in a working fluid is performed to form a hard coating film on the surface of an object which must be machined, said method of performing discharge surface treatment being characterized by using] comprising:

positioning a green-compact electrode comprised of a mixed material of a [material of said green-compact electrode for discharge surface treatment] metal powder and a [fluid which is the same as said] working fluid having a carbon component [as an electrode] opposite a work in a second working fluid, which is the same as the working fluid within the green-compact electrode; and

forming a hard coating film on the work by causing electrical discharge between the green compact electrode and the work.

6. (amended) An apparatus for performing electrical discharge surface treatment [for forming a hard coating film on the surface of an object which must be machined by using a green-compact electrode for discharge surface treatment and by performing discharging operation in working fluid, said apparatus for performing discharge surface treatment being characterized by] comprising: a [material of said] green-compact electrode [for discharge surface treatment] comprised of metal powder and a [fluid which is the same as said] working fluid having a carbon component [which constitute said green-compact electrode for discharge surface treatment]; a work; a working tank for receiving said work; and means for causing an electrical discharge between said green compact electrode and said work.

7. (amended) A method of recycling a green-compact electrode for electrical discharge surface treatment [including a discharge surface treatment step for forming a hard coating film on the surface of an object which must be machined by using a green-compact electrode for discharge surface treatment being characterized by] comprising:

a) [a] compression molding [step for molding] a mixed material of a [material of said green-compact electrode for discharge surface treatment] metal powder and a [fluid which is the same as said] working fluid having a carbon component to form the green-compact electrode;

b) positioning the green-compact electrode opposite a work;

c) [a discharge surface treatment step for] performing [a] discharge surface treatment [process] by [using an electrode obtained by compression molding] causing electrical discharge between the green-compact electrode and the work to form a hard coating on the work; [and]

d) pulverizing [step for forming] portions of the green-compact electrode [in] which [said electrodes] are left after said discharge surface [treatment step] treating has been completed into powder, [wherein] and

e) [said] compression molding [step and following steps are repeated after said pulverizing step has been completed] the powder obtained from the pulverizing step to obtain a new green-compact electrode.

**Claim 8 is added as a new claim.**